MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2018/2019

THN 3221 – HIGH SPEED NETWORKS

(All sections / Groups)

15 October 2018
2.30 pm – 4.30 pm
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This question paper consists of 4 printed pages (including cover page) with 5 questions only.

2. Attempt **ALL Questions.** All Questions carry equal marks (10 marks). The distribution of the marks for each question is given.

3. Please print all your answers in the answer booklet provided.

QUESTION 1 [4+3+3 marks]

(a) Define the following terms
   i. Propagation Delay
   ii. Processing Delay

(b) Elaborate **THREE** components in protocol where protocol is defined as "set of rules or conventions to exchange blocks of formatted data".

(c) List **THREE** advantages of packet switching over circuit switching.

QUESTION 2 [7+2+1 marks]

(a) Define the following parameters for a switching network:
   N = number of hops between two given end systems
   L = message length in bits
   B = data rate, in bits per second (bps), on all links
   P = fixed packet size, in bits
   H = overhead (header) bits per packet
   S = call setup time (circuit switching or virtual circuit) in seconds
   D = propagation delay per hop in seconds

   For N = 2, L = 4800, B = 9600, P = 1024, H = 16, S = 0.3, D = 0.002, compute the end-to-end delay for circuit switching and datagram packet switching. Assume that there are no acknowledgments. Ignore processing delay at the nodes.

(b) List any TWO operations in Switched Virtual Circuits (SVC).

(c) Define Committed Burst Size.

QUESTION 3 [5+3+2 marks]

(a) A check-in counter at has the mean arrival rate at 5 guests per 30 minutes and the mean service rate is 8 guests per 30 minutes.

   i. What is the average number of guests waiting?
   ii. What is the mean number of guests waiting and being served?
   iii. What is the average waiting time?
   iv. What is the average time a guest spends in the process of check in?
   v. What is the probability that the service facility is idle?

Continued.....

(b) Consider a LAN with 50 personal computers and a server. The average time for the server to respond to a query is 0.3 seconds and at peak times, the query rate over the LAN reaches 30 queries per minute. Assume it is a M/M/1 model.

i. What is the network utilization?

ii. What is the average residence time ignoring line overhead?

(c) How a packet is handled in Multiprotocol Label Switching (MPLS) network?

QUESTION 4 [5+3+2 marks]

(a) Draw a diagram to show following congestion control mechanisms

i. Policing

ii. Choke packet

iii. Backpressure

iv. Implicit congestion signaling

v. Explicit congestion signaling

(b) Describe Voice over Internet Protocol (VoIP).

(c) What is fast retransmission rule?

QUESTION 5 [4+4+2 marks]

(a) List **FOUR** advantages of Software Defined Network (SDN).

(b) Give a 5G network case study that related to new trends in networking.

(c) Describe software defined wide area network.

End of Page

APPENDIX

λ = arrival rate: mean number of arrivals per second

T_S = mean service time for each arrival: amount of time being served, not counting time waiting in the queue

σ_{TS} = standard deviation of service time

ρ = utilization: fraction of time facility (server or servers) is busy

u = traffic intensity

r = mean number of items in system, waiting and being served (residence time)

R = number of items in system, waiting and being served

T_r = mean time an item spends in system (residence time)

T_R = time an item spends in system (residence time)

σ_r = standard deviation of r

σ_{Tr} = standard deviation of T_r

w = mean number of items waiting to be served

σ_w = standard deviation of w

T_w = mean waiting time (including items that have to wait and items with waiting time = 0)

T_d = mean waiting time for items that have to wait

N = number of servers

$m_X(y)$ = the yth percentile: that value of y below which x occurs y percent of the time

General	Single Server
$r = \lambda T_r$ Little's formula	$\rho = \lambda T_S$
$w = \lambda T_W$ Little's formula	$r = w + \rho$
$T_r = T_W + T_S$	

Exponential Service Times (M/M/1)

$$r = \frac{\rho}{1-\rho} \qquad w = \frac{\rho^2}{1-\rho}$$

$$T_r = \frac{T_S}{1-\rho} \qquad T_W = \frac{\rho T_S}{1-\rho}$$

$$\sigma_r = \frac{\sqrt{\rho}}{1-\rho} \qquad \sigma_{Tr} = \frac{T_S}{1-\rho}$$

$$\Pr[R = N] = (1-\rho)\rho^N$$

$$m_r(y) = \frac{\ln\left(1 - \frac{y}{100}\right)}{\ln \rho} - 1$$